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Magnetic Resonance Findings of a Canine Benign Uveal Melanocytoma

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Abstract : A 13-year-old spayed female Beagle dog was referred with high intraocular pressure, hyperemia, and exophthalmos of the left eye and underwent ultrasound, which revealed a mass in the ciliary body of the left eye. Magnetic resonance (MR) imaging was ordered to evaluate invasion of surrounding structures and metastasis to the brain via the optic nerve. On MR imaging, a single, well-defined, smoothly marginated, triangular-to-oval-shaped mass was found. The mass was hyperintense on T1-weighted images and hypointense on T2-weighted images, similar to a previous case of ocular melanoma. The mass originated from the ciliary body and extended from the anterior chamber to the posterior chamber. Slight enhancement was observed in the mass. There was no evidence of invasion into surrounding structures or the optic nerve, and no sign of metastasis to the brain. The mass was histopathologically diagnosed as benign uveal melanocytoma.

Key words **:** Dog, Uveal melanoma, Ocular melanoma, Magnetic resonance imaging, Ultrasonography.

Introduction

Melanocytic tumor is the most common ocular tumor in dogs, although primary ocular tumors are uncommon in dogs (4). Papilloma, squamous cell carcinoma, lymphoma, hemangioma, transmissible venereal tumor, retinal blastoma, adenocarcinoma, seminoma, and glioblastoma have been reported in dogs as primary or secondary ocular tumors (13). Clinically differentiating melanocytoma from malignant melanoma is difficult (7). Classification of these tumors is made on the basis of nuclear features of the tumor cells, combined with their rates of mitosis (15). In dogs, uveal melanoma typically originates from the iris or ciliary body (4,5,14). However, primary choroidal melanoma is less common; only 6% of uveal melanomas principally affect the choroid (7,11). The involvement of the choroid typically extends from the anterior uvea (12). Anterior uveal melanoma often expands the iris and extends into the anterior chamber, or may appear as a mass posterior to the iris, which anteriorly displaces the iris (7). In dogs, ocular neoplasia is typically diagnosed with chronic eye problems, including corneal opacity, edema, or buphthalmos (6). Occasionally, the initial clinical findings of an anterior uveal melanoma include a pigmented mass that expands into the sclera, along with thinning of the sclera (7).

In human medicine, there have been reports that ocular melanoma shows specific characteristics in magnetic resonance (MR) imaging (2). In dogs, one report described MR image characteristics of 2 cases of malignant ocular melanoma (6). This report was written to describe clinical findings and MR characteristics of benign uveal melanocytoma in a Beagle dog.

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Case

A 13-year-old, spayed female Beagle dog presented with mild hyperemia and exophthalmos of the left eye (Fig 1). Intraocular pressure in the left eye was 40 mmHg, compared to 10 mmHg in the right eye. There was a visible mass on the left eye. On visual examination, there was no abnormality in the visual activity of the left eye. However, mydriasis was observed in the pupil light response test of the left eye. There were no significant abnormal findings in complete blood cell count or serum chemistry.

B-mode ocular ultrasonography (US) revealed a 1.3 cm × 0.8 cm mass in the ciliary body. On US, the mass was rounded, irregularly marginated, and well-defined with homogenously hyperechoic echogenicity, without blood flow distribution (Fig 2). Because of the suspicion of primary tumor on US, MR imaging was ordered to confirm invasion of surrounding tissue and metastasis to the brain via the optic nerve.

MR examination was performed under general anesthesia. Anesthesia was induced with propofol at a dose of 6 mg/kg intravenously and maintained with isoflurane in oxygen. A 0.3-T low-field MRI scanner (Airis II, Hitachi, Japan) and human joint coil were used at Chungbuk National University Veterinary Medical Center. The dog was positioned in sternal recumbency. Transverse, sagittal, and dorsal oblique planes were taken by using T1-weighted (pre- and postcontrast), T2-weighted, and fluid attenuated inversion recovery (FLAIR) scans. Additionally, dorsal oblique plane was taken to evaluate the optic nerve in greater detail. Water-fat separation T1-weighted images were obtained to clearly distinguish between the optic nerve sheath and surrounding fat. In T1, postcontrast images were obtained by intravenous administration of gadodiamide (Omniscan™, GE Healthcare Ireland, Cork, Ireland) at a dose of 0.1 mmol/kg.

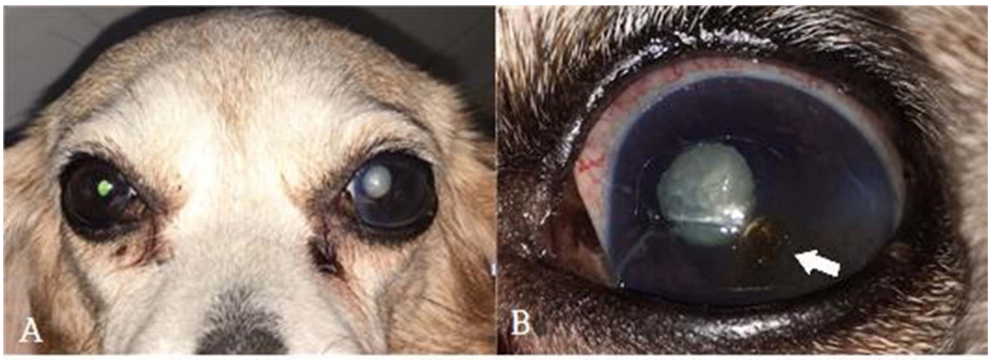

Fig 1. Photograph of patient. (A) Exophthalmos of the left eye; (B) Mild hyperemia and mass (arrow) of the left eye.

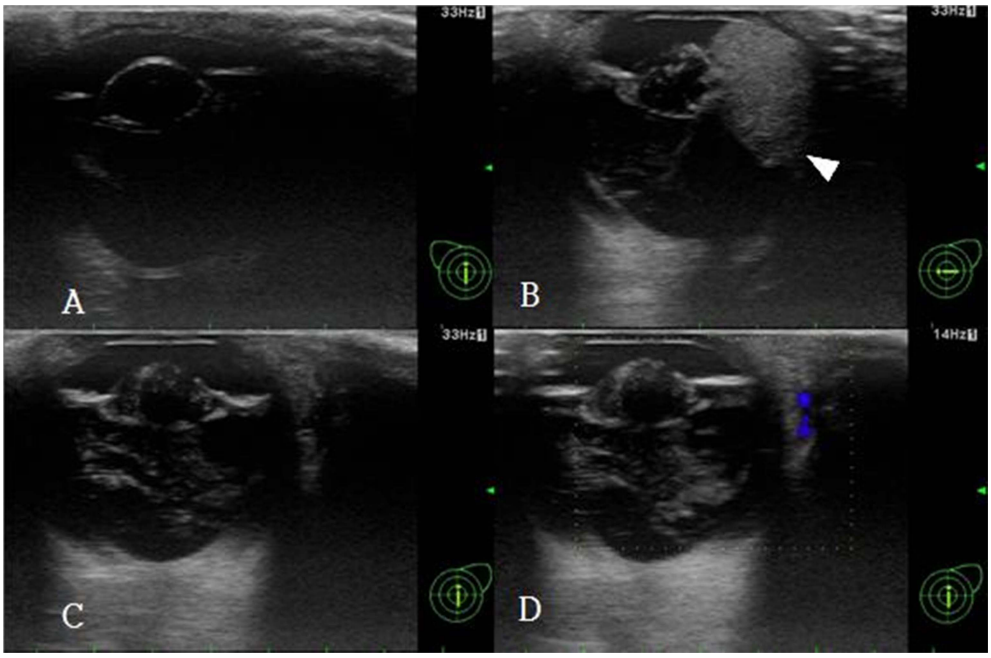

Fig 2. Ocular ultrasonography of the eye. (A) Vertical plane of the normal right eye, (B) horizontal plane, (C) vertical plane, and (D) Color Doppler examination of the left eye. A 1.3 cm × 0.8 cm, homogenously hyperechoic mass of ciliary body (arrowhead) was observed. Because of the mass, the lens was distorted medially. On Color Doppler examination, there was no blood flow distribution in the mass.

On MR imaging, there was a mass 1.1 cm × 1.1 cm × 1.5 cm in size, overlying from the ventral ciliary body to the ventral posterior chamber, but not invading the lens; it was well defined with a smooth margin and was round-to-oval shaped. The ocular contour slightly bulged to the outside, due to the lesion. Most of the mass was hyperintense on T1-weighted images, hypointense on T2-weighted images, and hypointense on FLAIR images. There was slight irregular enhancement within the mass (Fig 3). Water-fat separation images of the optic nerve sheath revealed no invasion toward the postorbital space (Fig 4).

The eye with the lesion was enucleated and analyzed for histopathology, which revealed that the cornea and anterior sclera were markedly expanded by an unencapsulated, poorly demarcated, infiltrative, densely cellular neoplasm. Neoplastic cells had dark brown to black intracytoplasmic pigment (melanin). Moderate anisocytosis and anisokaryosis were observed (Fig 5). On the basis of these findings, the diagnosis was benign uveal melanocytoma.

Based on the MR imaging findings and histopathologic findings, the patient was diagnosed with benign anterior uveal melanocytoma without invasion of the surrounding structures or optic nerve. The patient remained alive without recurrence or metastasis at 1 year postoperatively.

Discussion

Benign uveal melanocytomas are most common in the iris and ciliary body. Notably, only 6% of uveal melanocytomas primarily affect the choroid. Scleral or extra-scleral expansion is common for both anterior uveal and choroidal melanocytomas (7).

Most melanomas in dogs are locally invasive, but the incidence rate of metastasis to surrounding structures from the anterior uvea is low (4,5). On the other hand, in cases of human uveal melanoma, extraocular tumor growth was observed in

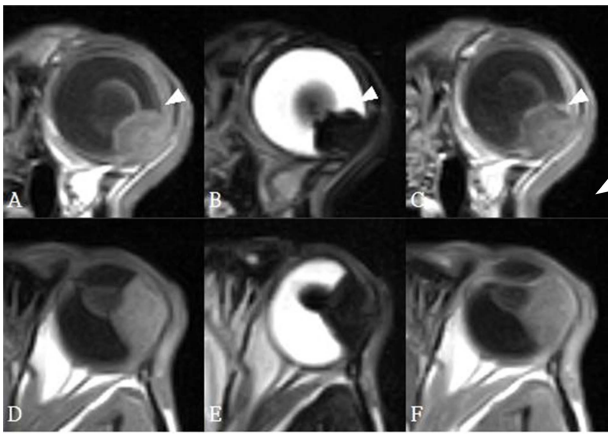

Fig 3. Ciliary body mass by magnetic resonance imaging. (A) Transverse precontrast T1-weighted, (B) T2-weighted, (C) postcontrast T1-weighted, (D) Dorsal oblique precontrast T1-weighted, (E) T2-weighted, and (F) postcontrast T1-weighted images. A well-defined, smoothly marginated, triangular-to-oval-shaped mass with signal hyperintensity on T1-weighted and signal hypointensity on T2-weighted magnetic resonance images of 1.1 cm × 1.1 cm × 1.5 cm (W × H × L) was observed at the left ocular ciliary body (arrowhead). The mass was located from the anterior chamber to the posterior chamber, originating from the ciliary body. The lens was displaced medially by mass effect. There was slight irregular contrast enhancement throughout the mass.

7%, while metastases of the eye and orbital optic nerve infiltration were observed in 13% (8). There are several risk factors for extraorbital metastasis, including tumor size, rupture of Bruch's membrane, and retinal invasion (10). Although a previous report suggests that the metastatic rate of ocular melanomas to the surrounding structure is lower in dogs than in humans, approximately 4% of ocular melanomas are known to metastasize to surrounding structures (3). Therefore, it is important to assess the size, location, and expansion of the tumor by using MR images. It may also be important for prediction of the extent of ocular melanomas and prognosis of ocular melanomas.

In human medicine, ultrasonography can be useful to differentiate between melanomas and simulating lesions. However, the characteristics of other lesions such as retinal hamartoma, tuberculoma, neurilemmoma, and combined choroidal-retinal detachment are similar to those of melanoma (1). In our case, ultrasonography confirmed the ocular mass. However, it could not reveal the precise size and location of the mass. Moreover, it could not evaluate whether the mass had invaded the surrounding structures, including the optic nerve. Importantly, MR images clearly revealed the exact size and location of the ocular mass and optic canal region in this patient. On MR examination, the mass was observed to expand the iris and extend into the anterior chamber, as well as posterior to the iris; this was consistent with a previous report of a case of uveal melanocytoma (7). In the patient described herein, no extra-scleral expansion was noted. We could rule out metastasis to surrounding structures, transition to the optic nerve, and remote transition to the brain.

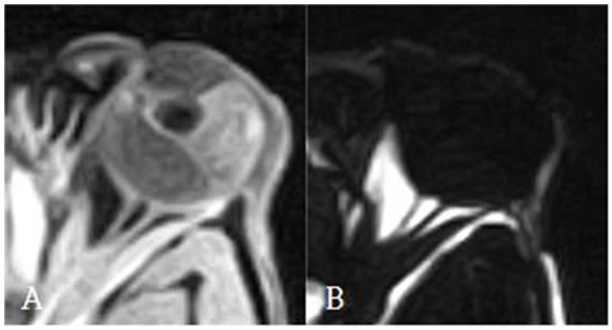

Fig 4. Ciliary body mass and optic canal by Water-fat separation images. (A) Fat suppressed T1-weighted (B) Water suppressed T2-weighted images. There was no evidence of invasion into the surrounding tissues or optic nerve.

MR images of the present case showed similar characteristics to malignant melanoma described in a previous report (6). The signal intensity of the mass in this dog was hyperintense on T1-weighted images and hypointense on T2-weighted images. In the Ga-DTPA contrast study, a slight and irregular enhancement was observed throughout the mass. In histopathological analysis, the mass of this patient was diagnosed as benign uveal melanocytoma. The MR characteristics of ocular melanoma in dogs are not well-known, but one veterinary study showed that ocular melanomas are hyperintense

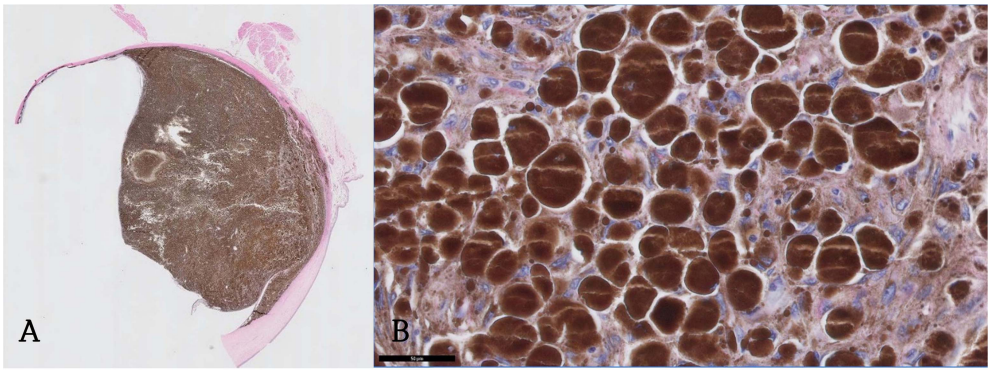

Fig 5. Histological findings of the enucleated eye with a pigmented melanoma. (A) The cornea and anterior sclera are markedly expanded by an unencapsulated, poorly demarcated, infiltrative, densely cellular neoplasm. (B) The neoplasm is composed of a mixture of heavily pigmented round cells and heavily pigmented spindle cells.

on T1-weighted images, hypointense on T2-weighted images, and irregularly enhanced at the circumference of the ciliary body (6). The masses were diagnosed as malignant melanoma. In human medicine, ocular malignant melanoma shows unique signal behavior, including high signal intensity on T1-weighted images and very low signal intensity on T2-weighted images (8). Moreover, human uveal malignant melanoma shows minimal enhancement. However, these also constitute signal features of a benign melanocytoma in human medicine (1). These characteristic signal intensities of benign melanocytoma and malignant melanoma are thought to be due to the paramagnetic effects of melanin in the tumor, as well as to acute and chronic hemorrhage (6,9). The similar signal intensity of canine uveal melanocytoma may be due to the effect of melanin within canine melanocytoma (6). These features of MR images are consistent with the characteristics of the patient in this case. Thus, this case report supports the use of these characteristics of canine ocular benign melanocytoma and malignant melanoma as the main differential diagnostic criteria among eye tumors.

Conclusions

In conclusion, canine benign ocular melanocytoma in our case shows similar signal intensity on MR images to that previously described in a case of dog with uveal malignant melanoma. These signal characteristics are thought to be due to high paramagnetic melanin contents in the tumor, as previously described in human medicine (9). Although MR imaging cannot distinguish benign melanocytoma from malignant melanoma, MR imaging can reveal the exact size and location of the mass and can help to easily assess invasion of the surrounding structures and optic pathway, especially metastasis to the brain via the optic nerve. In addition, it is possible to perform a differential diagnosis by using MR images.

Conflicts of Interest

No conflicts of interest have been declared.

Sources of Funding

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